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FOREST PEST MANAGEMENT

BIOLOGICAL EVALUATION R2-92-03

AN EVALUATION OF A DISORDER OF BLACK WALNUT SEEDLINGS ASSOCIATED WITH COLD STORAGE AT BESSEY NURSERY

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INTRODUCTION

A problem with Black Walnut (Juglans nigra L.) in cold storage at Bessey Nursery developed suddenly in March 1991. The problem was caused by storage molds, and had appeared from time to time in previous years. The 1991 episode was especially severe, and FHM personnel were asked to assist. This paper documents what was done to assess losses and limit spread of this disorder.

METHODS AND MATERIALS

Seedlings were lifted from the nursery bed, graded, bundled into groups of about 50, and placed into a cold room on March 19, 1991. Several seedlings developed disease lesions with fungal growth on their roots and lower stems by March 22, and Captan (3.5 tbs/gallon) was sprayed onto stacked seedling bundles. The treatment apparently did not work, because abundant fungal growth continued.

Forest Health Management personnel visited Bessey Nursery on March 26th. All the seedlings were taken out of the cold room and regraded. Diseased seedlings were discarded. Healthy seedlings were rebundled and then placed into the 34°F cold room. Thirty four bundles of 50 seedlings each were selected at random to determine how many seedlings were lost. Each seedling in each bundle was graded as: DISEASED - darkened root surfaces, soft to the touch and often with fungal mold growth, INTERMEDIATE - darkened root surface, but firm to the touch, or HEALTHY - firm roots with no discoloration. The average number per bundle of these seedlings in each health category was used as an estimate of loss for the entire seedling lot.

In addition, 100 seedlings in each of the three categories were set aside during grading. Fifty seedlings in each group were dipped in Benomyl (1 lb/100 gal) for 15 minutes, and the other 50 were left untreated. On April 19, these seedlings were planted in a test plot in a randomized block design with 6 treatments replicated 5 times. Ten seedlings were used for each treatment. Treatments included: healthy dipped, healthy untreated, diseased dipped, diseased untreated, intermediate dipped, and intermediate untreated. Individual seedlings and rows were planted 3 feet apart. Seedling survival was assessed on June 27 and October 3 (Table 1).

RESULTS AND DISCUSSION

The most important contributing cause of this storage mold outbreak was the temperature of the cold room in which the lifted seedlings were initially stored. Temperature is critical. Above 34°F, even small differences can affect fungal growth rates. Hygrothermograph readings showed that the temperature reached 40°F during the period the black walnut seedlings were in storage. This temperature creates conditions in which even otherwise innocuous saprophytic fungi can become aggressive enough to spread into living plant tissues. If this problem is to be managed, more critical control of the temperature is essential.

Of the 1646 seedlings assessed, 803 (49%) were healthy, 78 (5%) were intermediate and 765 (46%) were diseased. Based on these values, approximately 10,649 of the 23,150 seedlings initially placed in storage were discarded.

The actual number of seedlings discarded may have been higher (possibly as high as 11,807 seedlings), because many of the intermediates were probably also discarded. Healthy seedlings were easily graded as keepers and the diseased seedlings as discards. Seedlings initially graded as healthy were still alive 6 months after planting, and those graded diseased were all dead. The disposition of intermediates was a less obvious, more subjective choice. Intermediates represented a relatively small, although significant, portion of the seedling population. Their survival after 6 months was 64%, which represented 741 of the 23,150 seedlings initially placed in cold storage. Application of a fungicide did not increase survival rates (Table 2).

At a wholesale selling price of $157 per 1000 seedlings, Bessey Nursery lost an estimated $1671.89 to $1853.70 in potential revenue. Disease was spreading rapidly by the time seedlings were assessed and regraded, and it is likely that all seedlings would have been lost if action had been delayed a few days longer. Attentive action by the forest nursery manager in bringing this problem to the attention of Forest Health Management saved about $1671.89 for the nursery and enabled a supply of black walnut seedlings to be available when they were in demand.

Table. 1. Results of an assessment of black walnut seedlings at Bessey Nursery. Seedlings were evaluated for a disorder associated with surface mold fungi during cold storage.

Health category[1]	Number of seedlings	Average number/bundle (sd)
Healthy	803	23.62 (12.29)
Intermediate	78	2.29 (1.99)
Diseased	765	22.50 (11.90)

[1]Classification criteria were: DISEASED - darkened root surfaces, soft to the touch and often with fungal mold growth, INTERMEDIATE - darkened root surface, but firm to the touch, or HEALTHY - firm roots with no discoloration.

Table 2. Average survival 6 months after outplanting of seedlings that were dipped in fungicide (F) or left undipped at the time of planting, for seedlings that were classified as diseased (D), intermediate (I), or healthy (H) prior to planting.

	Number of living seedlings (out of 100)						
Treatment[1]	Row number					Average	sd
	1	2	3	4	5		
D	0	0	0	0	0	0	0
DF	0	0	0	0	1	0.2	0.45
I	5	7	8	3	9	6.4	2.41
IF	6	10	6	7	6	7.0	1.73
H	10	10	10	10	10	10.0	0
HF	9	10	10	10	10	9.8	0.45

[1]D = diseased, DF = diseased and dipped in fungicide, I = intermediate, IF = intermediate and dipped, H = healthy, HF = healthy and dipped